WE CLAIM:

1. An integral assembly, comprising:

a continuous ring disposed coaxial with, and orthogonal to a central axis,

said continuous ring comprising a plurality of surfaces,

said plurality of surfaces having a continuous outer surface;

said plurality of surfaces comprising a bell mouth surface in physical communication with a compressor shroud surface,

said compressor shroud surface being in physical communication with a diffuser surface, and

said diffuser surface being in physical communication with said bell mouth surface.

2. The integral assembly of claim 1, wherein said plurality of surfaces has a continuous inner surface;

said plurality of surfaces being characterized by a continuous cross section having a first cross sectional dimension longitudinally disposed parallel to said central axis; and

wherein said continuous cross section includes a plurality of cross sectional dimensions, said plurality of cross sectional dimensions including a second cross sectional dimension disposed orthogonal to said central axis.

3. The integral assembly of claim 1, wherein said bell mouth surface is physically attached to said compressor shroud surface .

4. The integral assembly of claim 3, wherein said bell mouth surface is physically attached to said compressor shroud surface through a lap joint.

5. The integral assembly of claim 1, wherein said compressor shroud surface is physically attached to said diffuser surface.

6. The integral assembly of claim 5, wherein said compressor shroud surface and said diffuser surface are a single piece of material .

7. The integral assembly of claim 1, wherein said diffuser surface is physically attached to said bell mouth surface.

8. The integral assembly of claim 7, wherein said diffuser surface is physically attached to said bell mouth surface using a first mechanical fastener.

9. The integral assembly of claim 1, wherein said bell mouth surface comprises a curved scalloped shaped portion arranged between a first mechanical fastener and said compressor shroud surface .

10. An integral assembly comprising:

a continuous ring disposed coaxial with, and orthogonal to a central axis;

said continuous ring comprising a plurality of contiguous surfaces;

said plurality of contiguous surfaces having a continuous outer surface characterized by a continuous cross-section longitudinally disposed parallel to said central axis;

said plurality of contiguous surfaces comprising a bell mouth surface in physical communication with a compressor shroud surface,

said compressor shroud surface in physical communication with a diffuser surface;

said diffuser surface in physical communication with said bell mouth surface;

said diffuser surface having a diffuser face on a portion of said continuous outer surface radially disposed about said central axis;

said diffuser face being perpendicular to said central axis;

said diffuser face comprising a plurality of vanes extending longitudinally away from said diffuser face in a direction of said central axis;

said integral assembly further including a compressor shroud comprising a compressor shroud ring having a first side separated from a second side; and

said first side of said compressor shroud ring being in physical communication with one or more of said vanes.

11. The integral assembly of claim 10, wherein at least one of said vanes includes a top surface that is parallel to said diffuser face, and wherein said first side of said compressor shroud is in physical communication with said top surface, such that said first side is arranged parallel to said diffuser face.

12. The integral assembly of claim 11, wherein a plurality of said vanes each include said top surface that is parallel to said diffuser face, and wherein said first side of said compressor shroud is physically attached to each of said plurality of said top surfaces.

13. The integral assembly of claim 10, wherein said diffuser face and said impeller shroud form a first sub-assembly, said first sub-assembly adapted for attachment to a second sub assembly, said second sub assembly comprising said bell mouth surface.

14. The integral assembly of claim 10, wherein said continuous ring includes a plurality of mounting holes arranged annularly at an outer portion of said continuous ring, said continuous ring comprising a plurality of contiguous surfaces.

15. An integral assembly, comprising:

a continuous ring disposed coaxial with, and orthogonal to a central axis;

said continuous ring comprising a plurality of contiguous surfaces;

said continuous ring having a plurality of mounting holes arranged annularly at an outer portion of said continuous ring;

said plurality of contiguous surfaces having a continuous outer surface characterized by a continuous cross-section longitudinally disposed parallel to said central axis;

said plurality of contiguous surfaces comprising a bell mouth surface in physical communication with a compressor shroud surface ,

said compressor shroud surface in physical communication with a diffuser surface;

said diffuser surface in physical communication with said bell mouth

surface;

said bell mouth surface comprising a curved scalloped shaped portion arranged between said diffuser surface and said compressor shroud surface ;

said diffuser surface having a diffuser face on a portion of said continuous outer surface radially disposed about said central axis;

said diffuser face being perpendicular to said central axis;

said diffuser face comprising a plurality of vanes extending longitudinally away from said diffuser face in a direction of said central axis;

said plurality of vanes each including a top surface that is parallel to said diffuser face,

said integral assembly further including a compressor shroud comprising a compressor shroud ring having a first side separated from a second side; and

said first side of said compressor shroud ring being in physical communication with each of said top surfaces of said plurality of vanes such that said first side of said compressor shroud ring is arranged parallel to said diffuser face.

16. An auxiliary power unit, comprising:

a compressor module;

said compressor module comprising an inlet in fluid communication with a bell mouth surface and with a compressor wheel;

said compressor wheel being able to rotate, about a central axis, between a compressor housing and a compressor shroud surface ;

said compressor wheel having a trailing edge in fluid communication with a leading edge of a diffuser surface;

wherein said bell mouth surface, said compressor shroud surface , and said diffuser surface comprise an integral assembly;

said integral assembly comprising:

a continuous ring disposed coaxial with, and orthogonal to said central axis;

said continuous ring comprising a plurality of surfaces;

said plurality of surfaces having a continuous outer surface and a continuous inner surface being characterized by a continuous cross section having a first cross sectional dimension longitudinally disposed parallel to said central axis;

said plurality of surfaces comprising said bell mouth surface in physical communication with said compressor shroud surface ;

said compressor shroud surface being in physical communication with said diffuser surface; and

said diffuser surface being in physical communication with said bell mouth surface.

17. The auxiliary power unit of claim 16, wherein said diffuser surface includes a diffuser face on a portion of said continuous outer surface radially disposed about said central axis;

said diffuser face being perpendicular to said central axis;

said diffuser face comprising a plurality of vanes extending

longitudinally away from said diffuser face in a direction of said central axis;

said auxiliary power unit further including a compressor shroud comprising a compressor shroud ring having a first side separated from a second side; and

said first side of said compressor shroud ring being in physical communication with one or more of said vanes.

18. An aircraft comprising the auxiliary power unit of claim 17.

19. A method of making an integral assembly, comprising the steps of:

forming a first sub-assembly having a first end and a second end;

forming a second sub-assembly having a first end and a second end;

attaching said first end of said first sub-assembly to said first end of said second sub assembly; and

attaching said second end of said first sub-assembly to said second end of said second sub-assembly, to produce said integral assembly, wherein said integral assembly comprises:

a continuous ring disposed coaxial with, and orthogonal to a central axis;

said continuous ring comprising a plurality of surfaces;

said plurality of surfaces having a continuous outer surface and a continuous inner surface;

said plurality of surfaces being characterized by a continuous cross section having a first cross sectional dimension longitudinally disposed parallel to said central axis;

said plurality of surfaces comprising a bell mouth surface in physical communication with a compressor shroud surface,

said compressor shroud surface being in physical communication with a diffuser surface; and

said diffuser surface being in physical communication with said bell mouth surface.

20. The method of claim 19, wherein said first sub-assembly comprises said compressor shroud surface and said diffuser surface.

21. The method of claim 20, wherein said first sub-assembly is machined from a single piece of material.

22. The method of claim 21, wherein said diffuser surface comprises a diffuser face having a plurality of vanes extending longitudinally away from said diffuser face in a direction of said central axis; and

said diffuser face and said vanes being machined into said single piece of material to produce said first sub-assembly.

23. The method of claim 22, further comprising the steps of forming a compressor shroud; and

attaching a compressor shroud to one or more of said vanes disposed on said diffuser surface;

said compressor shroud comprising:

a compressor shroud ring having a first side and a second side; and

said first side of said compressor shroud ring being in physical communication with one or more of said vanes.

24. The method of claim 20, wherein said first end of said first sub-assembly is located adjacent to said diffuser surface, and said second end of

said first sub-assembly is located opposite said diffuser surface and adjacent to said compressor shroud surface; and

said first end of said first sub-assembly being attached to said first end of said second sub-assembly using a first mechanical fastener.

25. The method of claim 24, wherein said second end of said first sub-assembly is attached to said second end of said second sub-assembly using a lap joint.

26. The method of claim 25, wherein said lap joint is welded or brazed.